WHAT IS CLAIMED IS:

1. A semiconductor device comprising:
   a vertically oriented junction diode;
   a contact-antifuse unit, the unit comprising an antifuse layer and a layer of silicide, the antifuse layer on and in contact with the silicide layer, wherein the contact-antifuse unit is in contact with an electrode of the junction diode.

2. The semiconductor device of claim 1 wherein the junction diode comprises:
   a first layer of heavily doped semiconductor material of a first conductivity type;
   a second layer of either a) lightly doped semiconductor material of a second conductivity type or of b) undoped semiconductor material, the second layer on and in contact with the first layer; and
   a third layer of heavily doped semiconductor material of the second conductivity type, the third layer on and in contact with the second layer.

3. The semiconductor device of claim 2 wherein the silicide is selected from the group consisting of cobalt silicide, chromium silicide, tantalum silicide, platinum silicide, nickel silicide, niobium silicide, and palladium silicide.

4. The semiconductor device of claim 3 wherein the antifuse layer comprises a grown dielectric.

5. The semiconductor device of claim 4 wherein the dielectric is silicon oxide.

6. The semiconductor device of claim 4 wherein the dielectric is silicon nitride.

7. The semiconductor device of claim 4 wherein the dielectric is silicon oxynitride.

8. The semiconductor device of claim 4 wherein the antifuse layer is in contact with the electrode of the junction diode.

9. The semiconductor device of claim 8 wherein the semiconductor material of the junction diode is polysilicon or polysilicon-germanium or germanium.

10. The semiconductor device of claim 9 wherein the first conductivity type is p-type.

11. The semiconductor device of claim 9 wherein the first conductivity type is n-type.

12. The semiconductor device of claim 8 wherein the silicide is cobalt silicide.

13. The semiconductor device of claim 8 wherein the junction diode and contact-antifuse unit are portions of a memory cell.

14. The semiconductor device of claim 13 wherein the memory cell is a portion of a memory array.

15. The semiconductor device of claim 14 wherein the memory array is a monolithic three dimensional memory array, the array comprising at least a first memory level formed at a first height and a second memory level formed at a second height different from the first height.

16. The semiconductor device of claim 2 wherein the silicide layer is in contact with the electrode of the junction diode.

17. The semiconductor device of claim 16 wherein the silicide is selected from the group consisting of cobalt silicide, chromium silicide, tantalum silicide, platinum silicide, nickel silicide, niobium silicide, and palladium silicide.

18. The semiconductor device of claim 17 wherein the antifuse layer comprises a dielectric grown on the silicide layer.

19. The semiconductor device of claim 18 wherein the dielectric is silicon oxide.

20. The semiconductor device of claim 18 wherein the dielectric is silicon nitride.

21. The semiconductor device of claim 18 wherein the dielectric is silicon oxynitride.

22. The semiconductor device of claim 18 wherein the semiconductor material of the junction diode is polysilicon.

23. The semiconductor device of claim 22 wherein the first conductivity type is p-type.

24. The semiconductor device of claim 22 wherein the first conductivity type is n-type.

25. The semiconductor device of claim 18 wherein the silicide is cobalt silicide.

26. The semiconductor device of claim 18 wherein the junction diode and contact-antifuse unit are portions of a memory cell.

27. The semiconductor device of claim 26 wherein the memory cell is a portion of a memory array.

28. The semiconductor device of claim 27 wherein the memory array is a monolithic three dimensional memory array, the array comprising at least a first memory level formed at a first height and a second memory level formed at a second height different from the first height.

29. The semiconductor device of claim 2 wherein the contact-antifuse unit further comprises a layer of conductive material in contact with the antifuse layer, wherein the conductive material is a member of a group consisting of titanium nitride, tantalum nitride, tungsten nitride, tantalum, and titanium tungsten.

30. The semiconductor device of claim 29 wherein the conductive material layer is in contact with the electrode of the junction diode.

31. The semiconductor device of claim 30 wherein the silicide is selected from the group consisting of cobalt silicide, chromium silicide, tantalum silicide, platinum silicide, nickel silicide, niobium silicide, and palladium silicide.

32. The semiconductor device of claim 31 wherein the antifuse layer comprises a dielectric grown on the silicide.

33. The semiconductor device of claim 32 wherein the dielectric is silicon oxide.

34. The semiconductor device of claim 32 wherein the dielectric is silicon nitride.

35. The semiconductor device of claim 32 wherein the dielectric is silicon oxynitride.

36. The semiconductor device of claim 32 wherein the semiconductor material of the junction diode is polysilicon or polysilicon-germanium or germanium.

37. The semiconductor device of claim 36 wherein the first conductivity type is p-type.

38. The semiconductor device of claim 36 wherein the first conductivity type is n-type.

39. The semiconductor device of claim 32 wherein the silicide is cobalt silicide.

40. The semiconductor device of claim 30 wherein the junction diode and contact-antifuse unit are portions of a memory cell.

41. The semiconductor device of claim 40 wherein the memory cell is a portion of a memory array.

42. The semiconductor device of claim 41 wherein the memory array is a monolithic three dimensional memory array, the array comprising at least a first memory level formed at a first height and a second memory level formed at a second height different from the first height.

43. The semiconductor device of claim 29 wherein the silicide layer is in contact with the electrode of the junction diode.

44. The semiconductor device of claim 43 wherein the silicide is selected from the group consisting of cobalt silicide, chromium silicide, tantalum silicide, platinum silicide, nickel silicide, niobium silicide, and palladium silicide.

45. The semiconductor device of claim 44 wherein the antifuse layer comprises a dielectric grown on the silicide.

46. The semiconductor device of claim 45 wherein the dielectric is silicon oxide.

47. The semiconductor device of claim 45 wherein the dielectric is silicon nitride.

48. The semiconductor device of claim 45 wherein the dielectric is silicon oxynitride.

49. The semiconductor device of claim 43 wherein the semiconductor material of the junction diode is polysilicon.

50. The semiconductor device of claim 49 wherein the first conductivity type is p-type.

51. The semiconductor device of claim 49 wherein the first conductivity type is n-type.

52. The semiconductor device of claim 45 wherein the silicide is cobalt silicide.

53. The semiconductor device of claim 43 wherein the junction diode and the contact-antifuse unit are portions of a memory cell.

54. The semiconductor device of claim 53 wherein the memory cell is a portion of a memory array.

55. The semiconductor device of claim 54 wherein the memory array is a monolithic three dimensional memory array, the array comprising at least a first memory level formed at a first height and a second memory level formed at a second height different from the first height.

56. The semiconductor device of claim 29 wherein the conductive material layer is titanium nitride.

57. The semiconductor device of claim 2 wherein the antifuse layer is a grown metal oxide.

58. The semiconductor device of claim 57 wherein the silicide is titanium silicide.

59. A semiconductor device comprising:

a vertically oriented junction diode;

a contact-antifuse unit comprising a silicide layer and a dielectric layer, wherein the contact-antifuse unit is in contact with the junction diode and wherein the dielectric layer is grown on the silicide layer.

60. The semiconductor device of claim 59 wherein the contact-antifuse unit is above the junction diode;

61. The semiconductor device of claim 60 wherein the silicide is selected from the group consisting of cobalt silicide, chromium silicide, tantalum silicide, platinum silicide, nickel silicide, niobium silicide, and palladium silicide.

62. The semiconductor device of claim 61 wherein the silicide is cobalt silicide.

63. The semiconductor device of claim 60 wherein the junction diode comprises:

a first layer of heavily doped semiconductor material of a first conductivity type;

a second layer of lightly doped semiconductor material of a second conductivity type or of intrinsic, undoped semiconductor material, the second layer on and in contact with the first layer; and

a third layer of heavily doped semiconductor material of the second conductivity type, the third layer on and in contact with the second layer.

64. The semiconductor device of claim 63 wherein the semiconductor material is polysilicon.

65. The semiconductor device of claim 60 wherein the junction diode and contact-antifuse unit are portions of a memory cell.

66. The semiconductor device of claim 65 wherein the memory cell is a portion of a memory array.

67. The semiconductor device of claim 66 wherein the memory array is a monolithic three dimensional memory array, the array comprising at least a first memory level formed at a first height and a second memory level formed at a second height different from the first height.

68. The semiconductor device of claim 59 wherein the contact-antifuse unit is below the junction diode.

69. The semiconductor device of claim 68 wherein the silicide is selected from the group consisting of cobalt silicide, chromium silicide, tantalum silicide, platinum silicide, nickel silicide, niobium silicide, and palladium silicide.

70. The semiconductor device of claim 69 wherein the silicide is cobalt silicide.

71. The semiconductor device of claim 68 wherein the junction diode comprises:

a first layer of heavily doped semiconductor material of a first conductivity type;

a second layer of lightly doped semiconductor material of a second conductivity type or of intrinsic, undoped semiconductor material, the second layer on and in contact with the first layer; and

a third layer of heavily doped semiconductor material of the second conductivity type, the third layer on and in contact with the second layer.

72. The semiconductor device of claim 71 wherein the semiconductor material is polysilicon or polysilicon-germanium.

73. The semiconductor device of claim 68 wherein the junction diode and contact-antifuse unit are portions of a memory cell.

74. The semiconductor device of claim 73 wherein the memory cell is a portion of a memory array.

75. The semiconductor device of claim 74 wherein the memory array is a monolithic three dimensional memory array, the array comprising at least a first memory level formed at a first height and a second memory level formed at a second height different from the first height.

76. A monolithic three dimensional memory array comprising a memory cell, the memory cell comprising:

a vertical junction diode; and

a contact-antifuse unit, the unit comprising a silicide layer and an antifuse layer, wherein the silicide layer is in contact with the antifuse layer,

wherein the contact-antifuse unit is in contact with the junction diode and

wherein the memory array comprises at least a first memory level at a first height and a second memory level at a second height different from the first height.

77. The memory array of claim 76 wherein the junction diode comprises polysilicon or polysilicon-germanium or germanium.

78. The memory array of claim 77 wherein the silicide is selected from the group consisting of cobalt silicide, chromium silicide, tantalum silicide, platinum silicide, nickel silicide, niobium silicide, and palladium silicide.

79. The semiconductor device of claim 78 wherein the antifuse layer comprises a dielectric grown on the silicide.

80. The semiconductor device of claim 79 wherein the dielectric is silicon oxide.

81. The semiconductor device of claim 79 wherein the dielectric is silicon nitride.

82. The semiconductor device of claim 79 wherein the dielectric is silicon oxynitride.

83. The semiconductor device of claim 79 wherein the contact-antifuse unit is above the junction diode.

84. The semiconductor device of claim 79 wherein the contact-antifuse unit is below the junction diode.

85. The semiconductor device of claim 77 wherein the junction diode comprises:

a first heavily doped polysilicon layer of a first conductivity type;

a second layer of a) lightly doped polysilicon of a second conductivity type or of b) undoped polysilicon, the second layer on an in contact with the first layer; and

a third heavily doped polysilicon layer of the second conductivity type.